

HP AdvanceNet

Using Serial Line IP Protocols

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HP AdvanceNet

HP 9000 Series 300 and 800 Computers
Using Serial Line IP Protocols

98194-60522, E0291

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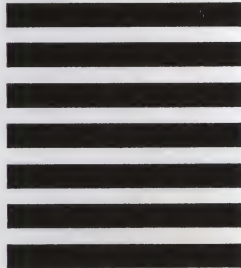
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Edition 1 February 1991

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Pages

Effective Date

All February 1991

REPORT ON THE PROGRESS OF THE WORK DURING THE YEAR 1900

Presented to the Board of Directors at the Annual Meeting held on the 15th day of December, 1900.

The year 1900 has been a year of unusual activity for the Company. The work has been carried on in accordance with the plan adopted at the Annual Meeting of 1899. The progress made during the year has been such as to give every one connected with the Company satisfaction. The work has been carried on in a most efficient manner, and the results have been such as to show that the Company is well equipped to meet the demands of the future.

The work has been carried on in accordance with the plan adopted at the Annual Meeting of 1899. The progress made during the year has been such as to give every one connected with the Company satisfaction.

Preface

This document describes how to use serial line IP protocols with HP 9000 computers. The protocols can be used with the Point-to-Point Link facility of HP's LAN/9000 product. This document assumes the reader is familiar with HP 9000 system administration and basics of serial communication.

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Introduction

Following is a brief overview of serial line IP and HP's Point-to-Point Link networking facility.

Why Serial Line IP?

Terrain, distance and property rights often limit LAN cabling. Where coax is restricted, network connections can be made by serial lines.

Serial lines are relatively inexpensive and easy to install. However, you need special software to run TCP/IP applications over a serial link. Specifically, you need software that implements protocols such as Serial Line Internet Protocol (SLIP).

HP's Point-to-Point Link

HP 9000 Computers implement SLIP and other serial line IP protocols with a feature called Point-to-Point Link (PPL). The PPL facility is supplied with HP's LAN/9000 product.

PPL includes a command program (named *ppl*), a supporting utility and a sample file.

You can use PPL to set-up:

- Dial-in to HP 9000 serial IP lines.
- Dial-out from HP 9000 serial IP lines.
- Direct connection to HP 9000 serial lines.

Dialing-in to HP 9000

Users at remote supported terminals or PCs can establish dial-in IP connections. This may be with or without login. For a login connection, the user establishes a modem link to HP 9000 and logs in as usual. After login, the user invokes *ppl* at the HP 9000 shell prompt. *ppl* starts the desired serial IP protocol, allowing the user full network access to HP 9000.

For a connection without login, the user simply dials in to a preset HP 9000 *ppl* line. The specified serial protocol is already running on that line.

Dialing-out from HP 9000

HP 9000 users can establish dial-out IP connections. This may be to any remote host that runs a supported serial IP protocol. Dial-out may be either with or without login.

For a login connection, the login is done by *ppl* and is transparent to the user. The user simply invokes *ppl* at the HP 9000 shell prompt. *ppl* establishes a modem link to the specified host and logs in. *ppl* runs a command on the remote machine to initiate the specified serial IP protocol. The connection is established.

For a connection without login, the user's action is the same. After *ppl* is invoked, a preset *ppl* line is assigned to that user. The user has full network access to the remote host.

Direct Connections

The system administrator may set-up a direct (hardwired) IP connection between HP 9000 and a remote host. In effect, this is simply a long distance extension of the LAN. To the user, this connection is transparent.

Installation

Installation consists of loading software and setting-up necessary support files. Each of these steps requires super-user privileges.

Note This document assumes the necessary hardware has been installed (cables or telephone connections, modems, etc.). The same hardware is required for UUCP connections. For details, refer to your *HP-UX System Administrator's Manual* (98594-90060) or *HP-UX Concepts and Tutorials: UUCP* (97089-90053).

Loading PPL Software

PPL software is supplied on the LAN/9000 installation tape. It is part of the NETINET fileset. If you are loading the entire networking partition, this fileset is loaded automatically.

Creating System Files to Support PPL

You need to create device files in the */dev* directory for serial ports and the network interface used by PPL. If you use the dial-out feature, you also need to create entries for UUCP System and Device files.

Note Following are brief instructions for */dev* and UUCP files. For details, refer to the manuals cited earlier.

Creating Device Files for Serial Ports

Each serial port used for PPL may require one to four */dev* entries. Depending on the hardware attached, you may need entries for dial-in, dial-out, autodial, direct connection or any combination of the four.

You create */dev* entries with SAM, the System Administration Manager. Alternately, you can use the *mknod(1M)* command.

Following is a sample *mknod* entry:

```
% mknod /dev/ttyd10 c 1 0x000002 #dial-in
```

It is important to create the device files with appropriate minor numbers. The UUCP manual describes how to arrive at the minor number of the device file for dial-in, dial-out and direct connections.

Creating UUCP System and Device Files

This step is necessary if you are using the dial-out feature.

For dial-out, PPL requires entries to two UUCP configuration files: The System file and the Devices file. Both of these files are in the */usr/lib/uucp* directory.

Note

PPL uses the UUCP configuration files only. It does not use UUCP executables. Only the Systems and Devices files need to be installed. The format of the files must match that of HoneyDanBer (HDB) UUCP. HDB UUCP is supplied with HP-UX Series 300 Release 6.2, HP-UX Series 800 Release 2.0 and all later HP-UX releases.

If the appropriate entries are not already there, you need to make the necessary edits. The UUCP System file should contain an entry for each remote host that may be called. The UUCP Devices file should contain an entry for each serial port to be available for dial-out.

For example, suppose you are setting up dial-out to a remote machine named daffy. daffy is running a 1200 baud modem at 5551212 and the connection is available anytime. To dial up daffy, you need a Systems file entry such as the following:

```
daffy Any,2 ACHUHAYESSMART 1200 5551212 ogin:notused word:xyz
```

You also need at least one Devices file entry for a 1200 baud modem:

```
ACHUHAYESSMART cu101 cu101 1200 hayes
```

For details about syntax of these file entries, refer to the UUCP manuals cited earlier in this chapter.

Creating a Device File for the Network Interface

Ensure that you have a `/dev/ni` device file with a major number of 56 and minor number of 0. If it is not already present, create it using the following command:

```
% mknod /dev/ni c 56 0 #network interface
```

The *ppl* program uses this device to pass packets between the serial line and IP.

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Configuration

PPL Configuration involves creating three files:

- *ppl.users*
- *ppl.ipool*
- *ppl.remotes*

Each is a simple ASCII file. Each is owned (created) by the super-user and located in the */usr/lib/ppl* directory. The files *ppl.users* and *ppl.ipool* must be created from scratch. A template is provided for *ppl.remotes*.

Note *ppl.users* and *ppl.ipool* are optional files. They allow for special circumstances as described below. Of the three files, only *ppl.remotes* is absolutely required for PPL operation.

Editing the *ppl.users* File

The *ppl.users* file may be used for dial-in or dial-out. It maps each user name to a single remote host. This allows a dial-in user to invoke *ppl* without identifying the remote host that is calling. It allows a dial-out user to invoke *ppl* without specifying the remote host that is being called.

Format of *ppl.users* is:

<username> <hostname>

where *username* is the login of the user, *hostname* is the identifier of the remote host. The hostname may be either an Internet address in dot

notation, or host alias, provided the alias is known to the local host. (The alias must be listed in */etc/hosts* or the Yellow Pages database, or it must be resolved using the domain name server.)

When *ppl* is invoked, it finds the hostname associated with the user's login. It uses this name to access connection parameters stored in *ppl.remotes*.

Following are sample *ppl.users* entries:

```
robd    columbia.nasa.gov
davey   elk
rons    raindeer
susie   123.33.42.1
```

Editing the *ppl.ipool* File

The *ppl.ipool* file may be used for dial-in. It specifies a pool of local Internet addresses to be used for modem connections.

This file is only necessary if you are using a modem pool. Generally, a modem pool is set up when the UUCP subsystem is configured at boottime. The pool allows the host to assign modem ports to dial-in users as needed.

When *ppl* receives a dial-in request, it identifies the remote host that is calling. *ppl* then checks if a specific port and local Internet address is allocated for use by that host. If not, *ppl* selects a port from the modem pool. Similarly, *ppl* selects a local Internet address from *ppl.ipool*.

Format of *ppl.ipool* is:

<Internet_address>

where *Internet_address* is any valid Internet address assigned to the local host. It must be in dot notation.

Sample *ppl.ipool* entries:

```
123.22.33.11
123.22.33.112
```

Editing the *ppl.remotes* File

The *ppl.remotes* file is required file for all PPL connections. It is the central database used by the *ppl* program. *ppl.remotes* contains an entry for each remote host to which *ppl* can establish a connection. The entry contains parameters which allow *ppl* to set up the connection.

Each entry consists of a multi-line form. Depending on the type of connection you are permitting, direct, dial-in, dial-out, or both dial-in and dial-out, you enter different data. However, the format of the form is alike for all four types.

Following is the format of a *ppl.remotes* form:

```
# your comments here
# remote hostname or Internet address
# local hostname or Internet address
# Internet mask
# protocol [SLIP] [ASLIPC] [ASLIPS] [PPP]
# type [DIRECT] [DIALIN] [DIALOUT] [DIALIN & DIALOUT]
# UUCP system name
# line parity [EVEN] [ODD] [NONE]
# line speed
# serial line
# phone number
# modem control available
# log in info
# command name
```

The top several lines are reserved for comments describing the entry. Use as many lines as necessary. Begin each line with a “#”.

The other lines are for entering data. They begin with a data field, followed by a comment which describes the data to enter.

Note	Depending on the type of connection, some data fields may not be used. However, all lines must be present for the form to be read by <i>ppl</i> . Within lines containing data fields, do not modify any text following “#”.
-------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Following is a description of each data field:

remote hostname or Internet address. This identifies the remote host. It may specify a host name or alias, provided the name or alias can be resolved to an Internet address (by */etc/hosts*, the Yellow Pages or domain name server). It may also be the Internet address itself in dot notation. This field is required for all connections.

local hostname or Internet address. This identifies the local host. It may specify a host name or alias, provided the name or alias can be resolved to an Internet address (by */etc/hosts*, the Yellow Pages or domain name server). It may also be the Internet address itself in dot notation. This field is optional for all connections. If the field is left blank, *ppl* assigns a local Internet address from *ppl.ipool*.

Internet mask. This specifies a mask which may be used to set up an IP subnet. If left blank, the mask is derived from the local Internet address.

type [SLIP] [ASLIPC] [ASLIPS] [PPP]. This specifies the protocol to be used for that connection: Serial Line Internet Protocol (SLIP); Abbreviated Serial Line Internet Protocol Client (ASLIPC); Abbreviated Serial Line Internet Protocol Server (ASLIPS); or Point-to-Point Protocol (PPP). This field is required for all connections.

Note Currently, only the SLIP, ASLIPC and ASLIPS options are supported.

type [DIRECT] [DIALIN] [DIALOUT] [DIALIN & DIALOUT]. This specifies connection type. It is required for all connections. For a direct connection (hardwired), enter DIRECT; for dial-in, DIALIN; for dial-out, DIALOUT. To accommodate either dial-in or dialout, enter: DIALIN & DIALOUT.

UUCP system name. This field is required if: 1) You are using dial-out or a modem pool; and 2) The name specified for the remote host in the UUCP System file is different from that specified in the remote hostname or Internet address field of *ppl.remotes*. If so, enter the UUCP system name here.

line parity [EVEN] [ODD] [NONE]. This field is used for dial-out and is optional. It specifies the line parity to be used after the modem connection has been established.

line speed. This field is required if: 1) You are using dial-out but not using a modem pool; or 2) You are using a direct connection. It specifies the line speed to be used before and after the modem connection is established. You may enter any baud rate supported by system hardware up to 9600 baud.

serial line. This field is required if: 1) You are using dial-out but not using a modem pool; or 2) You are using a direct connection. Enter the name of a specific */dev* node (device file) to be used for the connection (for example, *tty0p7* or *tty0p4*).

phone number. This field is required for dial-out if you are not using a modem pool. Enter the phone number of the remote host (for example, 5554423022 or 555-442-3022). The entry may consist of numeric characters and "-" or "=" symbols. A "-" specifies a 5-second pause. An "=" specifies wait for a secondary dial tone. If you are using a modem pool, *ppl* gets the number from the UUCP Systems file.

modem control available. This field is required for all dial-out and direct connections. It controls the use of modem signals during and after the dialing phase of *ppl*. If you specified DIRECT in the options field above, enter NO here. If you specified DIALOUT or DIALIN & DIALOUT, enter YES here.

log in info. This field is required for dial-out connections with login. It supplies the dialogue needed to login to the called host. The syntax is identical to the login entry in the UUCP Systems file. It includes a series of send/expect strings, separated by spaces.

command name. This field is required for dial-out connections with login. It supplies the dialogue needed to invoke the serial line IP protocol on the called host. (Note that, for an IP link to be established, compatible protocols must be running on each side of the line.) The field uses the same syntax as the log in info field above.

As mentioned previously, a template for *ppl.remotes* exists under */usr/lib/ppl*. It provides a blank form you may copy for each *ppl.remotes* entry. The filled-in forms may be concatenated in any order.

Following sections describe how to edit the forms for dial-in, dial-out or direct connections.

Editing Dial-in Forms

Following are two sample *ppl.remotes* file entries for dial-in connections. One shows configuration of dial-in with login. The other shows configuration of a preset ppl dial-in line. Keep in mind the local host is the HP 9000 you are configuring. The remote host is the machine which is dialing in.

```
# Sample #1: Dial-in with login.
#
# Sample entry in ppl.remotes file on machine biggy.
# Enables machine smally to dial in and have a SLIP
# connection to biggy. The user at smally must have
# a login on biggy. Connection works as follows:
# Machine smally establishes a modem connection. User
# logs in and runs ppl. ppl converts the serial line
# to SLIP.
#
smally      # remote hostname or Internet address
biggy       # local hostname or Internet address
            # Internet mask
SLIP        # protocol [SLIP] [ASLIPC] [ASLIPS] [PPP]
DIALIN      # type [DIRECT] [DIALIN] [DIALOUT] [DIALIN & DIALOUT]
            # UUCP system name
NONE        # line parity [EVEN] [ODD] [NONE]
            # line speed
            # serial line
            # phone number
NO          # modem control available
            # log in info
            # command name
```

Note The preceding sample assumes biggy is configured with the appropriate dial-in device file and that a modem is online. It also assumes biggy has a *getty* running on the serial port to which the modem is attached.

If the *ppl.users* file on biggy has an entry for the remote user, the user need not specify smally when invoking *ppl*. The user enters simply:

```
% ppl
```

If there is no such *ppl.users* entry, the user enters:

```
% ppl smally
```


Sample #2: Dial-in to preset ppl line.

```
# Sample entry in ppl.remotes file on machine pizza.
# Enables machines of type pasta to dial in and have
# a SLIP connection to pizza (pizza views each caller
# as the same IP address). Connection works as fol-
# lows: ppl runs continuously on pizza. When a dial-
# in request is heard at ttyd01, ppl establishes the
# SLIP connection immediately.
#
pasta      # remote hostname or Internet address
pizza      # local hostname or Internet address
           # Internet mask
SLIP        # protocol [SLIP] [ASLIPC] [ASLIPS] [PPP]
DIRECT      # type [DIRECT] [DIALIN] [DIALOUT] [DIALIN & DIALOUT]
           # UUCP system name
NONE        # line parity [EVEN] [ODD] [NONE]
2400        # line speed
ttyd01      # serial line
           # phone number
YES          # modem control available
           # log in info
           # command name
```

Note The preceding sample assumes pizza is configured with the appropriate dial-in device file and that a modem is online. It also assumes pizza does not have a *getty* running on the serial port to which the modem is attached.

ppl may be started on pizza at boottime or anytime thereafter. It may be executed at boottime by including the following in the */etc/netlinkrc* script:

```
ppl -o pasta &
```

Note Because *ppl* waits until the first dial-in, it should be executed in background.

Editing Dial-out Forms

Following are two sample *ppl.remotes* file entries for dial-out connections. One is for dial-out with login. The second is for dial-out to a preset serial IP line, no login required. Again, the local host is the HP 9000 you are configuring. The remote host is the machine to which HP 9000 users are dialing out. Keep in mind that, in both cases, *ppl* does the login. Login is transparent to the user.

```
# Sample #3: Dial-out with login.
#
# Sample entry in ppl.remotes file on machine misty.
# Enables machine misty to dial out and have a SLIP
# connection to foggy. The IP addresses of misty and
# foggy are known to each machine beforehand. Con-
# nection works as follows: User at misty runs ppl,
# which dials out to foggy. ppl logs in and runs SLIP
# on foggy using login and command sequence listed in
# this entry.
#
foggy      # remote hostname or Internet address
misty      # local hostname or Internet address
           # Internet mask
SLIP       # protocol [SLIP] [ASLIPC] [ASLIPS] [PPP]
DIALOUT    # type [DIRECT] [DIALIN] [DIALOUT] [DIALIN & DIALOUT]
           # UUCP system name
NONE       # line parity [EVEN] [ODD] [NONE]
9600       # line speed
           # serial line
8005551212 # phone number
YES        # modem control available
login: guest ssword:guest guest_tristar #log in info
"" foggyslip\s-r\smisty ready           #command name
```

Note The preceding sample assumes misty has the necessary UUCP Systems and Devices files entries for dial-out to foggy. For an example of these entries, refer to the "Installation" section of this manual. The sample also assumes misty is configured with the appropriate dial-out device file and that a modem is online.

The login and password on foggy are both "guest." The command that executes SLIP on foggy is *foggyslip -r misty*. The command displays "ready" after starting up. The syntax for the login, password and command sequences in *ppl.remotes* must follow UUCP conventions.

```

# Sample #4: Dial-out without login.
#
# Sample entry in ppl.remotes file on machine slinky.
# Enables machine slinky to dial out and have a SLIP
# connection to stuffy. stuffy has a dedicated SLIP
# line connected to a modem that answers to a phone
# number known to slinky. The IP addresses of slinky
# and stuffy are known to each machine beforehand.
# Connection works as follows: User at slinky runs
# ppl, which dials out to the preset SLIP line. The
# connection is established immediately.
#
stuffy      # remote hostname or Internet address
slinky      # local hostname or Internet address
            # Internet mask
SLIP        # protocol [SLIP] [ASLIPC] [ASLIPS] [PPP]
DIALOUT     # type [DIRECT] [DIALIN] [DIALOUT] [DIALIN & DIALOUT]
hiho        # UUCP system name
NONE        # line parity [EVEN] [ODD] [NONE]
9600        # line speed
            # serial line
            # phone number
YES         # modem control available
            #log in info
            #command name

```

Note The preceding sample assumes slinky has the necessary UUCP Systems and Devices files entries for dial-out to stuffy. Here, stuffy is known to the Systems file as "hiho." The sample also assumes slinky is configured with the appropriate dial-out device file and that a modem is online.

Editing a Direct Connection Form

Following is a sample *ppl.remotes* file entry for a direct connection. Generally, such a connection is established at bootime, using script in the */etc/netlinkrc* file.

```
# Sample #5: Direct connect

# Sample entry in ppl.remotes file on machine minnie.
# Sets up direct SLIP connection to mickey. To users
# at both machines, minnie and mickey appear to be
# on same LAN.
#
mickey      # remote hostname or Internet address
minnie      # local hostname or Internet address
            # Internet mask
SLIP        # protocol [SLIP] [ASLIPC] [ASLIPS] [PPP]
DIRECT      # type [DIRECT] [DIALIN] [DIALOUT] [DIALIN & DIALOUT]
            # UUCP system name
ODD         # line parity [EVEN] [ODD] [NONE]
9600        # line speed
tty04#      # serial line
            # phone number
NO          # modem control available
            # log in info
            # command name
```

Note The preceding sample assumes the necessary cable connections have been made between ports on each machine. Be sure there is no *getty* running on the serial port at either end. The sample also assumes minnie is configured with the appropriate direct connect device file.

ppl may be executed at bootime by including the following in the */etc/netlinkrc* script on minnie:

```
ppl -o mickey &
```

Note Because *ppl* waits until the first dial-in, it should be executed in background.

Operation

This section describes how to operate PPL dial-in, dial-out and direct-connect features.

Using the Dial-in Feature

Any remote host or PC with appropriate dial-out capability may dial-in to an HP 9000 serial IP line. However, the following must be true:

- The remote host has an entry in *ppl.remotes* of the HP 9000.
- The remote host is using the serial IP protocol specified in that *ppl.remotes* entry.
- For dial-in with login, the remote user must have a login on the HP 9000.

Establishing a Connection

The following procedure applies to dial-in with login. Keep in mind it is written for a remote user who may or may not be at another HP 9000. To establish a dial-in with login connection, the remote user must do the following:

1. Establish a modem connection to the HP 9000. (Depending upon the communications program used, this step may or may not be transparent to the user.)
2. Login on the HP 9000.

3. Invoke *ppl* at the HP 9000 shell prompt. If there is an entry for the user's login in *ppl.users*, enter simply:

```
% ppl
```

If there is no entry in *ppl.users*, specify the calling host by name or Internet address. For example:

```
% ppl donald  
% ppl 64.0.0.9
```

When *ppl* starts, a display such as the following appears:

```
ppl: starting for joe at Fri Jan 5 14:16:14 1990
```

ppl searches *ppl.remotes* for the calling host's entry. From this entry it gets parameters to set up the IP connection.

4. After the IP connection is started, exit the communications communications program. (Again, depending on the program used, this step may be automatic.)
5. Invoke the desired networking software. For example, to *ping* to remote machine hopper over the SLIP connection, enter:

```
% ping hopper
```

For a dial-in without login connection, the procedure is somewhat different:

1. Dial-in the number of the preset HP 9000 *ppl* line. This number is generally provided by the HP 9000 system administrator.
2. After the modem connection is established, exit the communications program.
3. Invoke the desired networking software. (Recall that, for preset *ppl* dial-in, the IP connection is available immediately after the modem connection is established.)

4-2 Operation

Terminating a Connection

The IP connection is lost when the line is hung up from either end. The *ppl* program senses loss of carrier and terminates gracefully.

The IP connection can also be terminated by the HP 9000 super-user using one of the lock files that *ppl* creates in the */usr/spool/ppl* directory. The lock files are of the form *ppl.laddr* and *ppl.raddr*, where *laddr* and *raddr* are Internet addresses (in hexadecimal notation) of the IP connection.

To kill *ppl* using the lock files, the super-user types the following at the shell prompt:

```
% sh lock_file_name
```

where *lock_file_name* is the name of either the remote or local lock file. The lock files have a shell script that causes *ppl* to exit gracefully.

Following is a sample lockfile:

```
kill -15 2213 # rhost_name=slip4 creator=joelw  
# tty=/dev/tty0 Linet=slip1 Rinet=15.255.136.6 protocol=SLIP
```

Using the Dial-out Feature

The PPL dial-out feature is available to any HP 9000 user. Keep in mind that, for dial-out only, *ppl* utilizes the UUCP Systems and Devices files. The necessary entries to these files must be present for each dial-out connection.

Establishing a Connection

The following procedure applies to dial-out with or without login. Recall that, from the HP 9000 user's perspective, the two types of connection are the same. To establish a dial-out serial IP connection, the HP 9000 user must do the following:

1. Invoke *ppl* at the shell prompt. Enter:

```
% ppl -o
```


After *ppl* starts, a display such as the following appears:

```
ppl: starting for chip at Fri Jan 15 12:16:19 1990
```

ppl checks the *ppl.users* file for an entry with the user's login. If an entry is found, *ppl* uses the associated host name to search *ppl.remotes* for connection parameters.

If there is no entry in *ppl.users*, specify the called host by name or Internet address. For example:

```
% ppl -o jumbo
```

ppl establishes a modem connection. If a login and command sequence is provided in *ppl.remotes*, *ppl* logs in and starts the desired protocol on the remote host. For connections without login, the protocol is already running on the remote host.

After the IP connection is established, the following is displayed:

```
initialization complete, protocol running
```

2. At this point, the HP 9000 shell prompt returns. Invoke the desired networking software.

Terminating a Connection

Once started, the *ppl* program runs until the carrier signal is lost or the program stopped. The program may be stopped by the super-user using lock files. This is explained in "Using the Dial-in Feature."

Dialing Out to an Unknown Remote Address

Suppose an HP 9000 user wants to dial out to a remote SLIP connection, but the remote IP address is unknown. This may be the case if the remote machine has a modem pool for dial-in. Much as the HP 9000 uses *ppl.ipool*, the remote machine may have a scheme to assign local addresses dynamically.

In this situation, *ppl* dial-out does not work initially, because there can be no preconfigured remote address in *ppl.remotes*.

The workaround is to first start SLIP on the remote machine using a conventional dialing program. After the connection is established, note the local address assigned on the remote machine. Next, exit the dialing program and edit *ppl.remotes* to include the remote IP address. Finally, invoke *ppl* to complete the connection at the HP 9000 end.

For example:

1. Connect to the modem from which you will dial out:

```
% cu -s2400 -l tty03 dir
```

2. Send a command string to the modem to dial out to the remote host:

```
atdt5551212
```

3. Assuming there is a *getty* listening at that port, log in on the remote machine.
4. Use the appropriate command sequence to execute SLIP on the remote machine. When the program starts, note the local IP address used. (Keep in mind this is the remote address from the perspective of the HP 9000.)
5. At the HP 9000, open another window and edit *ppl.remotes* to include the remote IP address.

6. Back in the first window, start *ppl* by entering:

```
~&ppl -o <hostname>; sleep 9999
```

where *<hostname>* is the name of the remote host.

7. In the second window, invoke the desired networking application.

Using a Direct Connection

The system administrator may set-up a direct PPL connection. This can be initialized at boot time or anytime thereafter.

To the user, the direct connection is transparent.

To set-up a direct connection at boot time, the super-user inserts a line such as the following in the */etc/netlinkrc* file:

```
ppl -o pluto
```

where *pluto* is the name of the remote machine.

Note The two machines should be connected via serial ports. There should not be a *getty* running on the serial port of either machine.

Maintenance

This section describes PPL maintenance tasks, including: Checking status of *ppl* connections, creating a billing file and logging PPL events. This section also includes a note about using LAN/9000 diagnostics on a serial line.

Checking Connection Status

You can configure PPL to maintain a status file of active connections. The file is binary but can be displayed with *pplstat(1)*.

Creating a Status File

The status file can be set-up at boot time or anytime thereafter. To do so, create a zero length ASCII file named *ptmp* in the */usr/spool/ppl* directory.

The *ptmp* file is maintained by invocations of *ppl*. Each time a new serial port is used, an entry is added to the file for that port. Any subsequent *ppl* use of that serial port results in an update to the file.

To create and initialize the file at boot time, add the following to the */etc/netlinkrc* script:

```
PTMP = /usr/spool/ppl/ptmp
if [ -f $PTMP ]
then
    rm $PTMP
    touch $PTMP
    chmod 644 $PTMP
endif
```

To create the file anytime after boottime, enter the following:

```
% cd /usr/spool/pp1
% touch ptmp
% chmod 644 ptmp
```

To disable this feature, simply remove the ptmp file. (If the file does not exist, *pp1* ignores this feature.)

Displaying a Status File

As mentioned, the *ptmp* file is binary. To display the file, use *pplstat(1)*. Enter the following:

```
% pplstat
```

A display such as the following appears:

log_name	joelw
rhost_name	slip4
system_name	slip4
LinetAddress	slip1
Rinetaddr	43.0.0.2
tty	/dev/tty0
ni	/dev/nio
status	SLIP
killfile (r)	/usr/spool/pp1/pp1.2b000002
killfile (l)	/usr/spool/pp1/pp1.2b000001
start_time	Wed Jan 10 13:24:17: 1990

Note *pplstat* only displays information for connections that are not idle.

Creating a Billing File

You can set-up a file to record connection information such as user, start time and end time. Such a file is useful for billing purposes. To use this feature, create an empty ASCII file (zero length) named *bill* in the */usr/spool/ppl* directory.

After termination of each invocation of *ppl*, information for that connection is entered in the file. Records within the file are ordered according to end time.

A sample billing file (containing two records):

```
; 11/19/89 15:07:29 ; 11/19/89 14:37:27 ; goofy ; 70.0.0.4 ; joelw ; ttyd0 ; SLIP;  
; 11/19/89 15:18:43 ; 11/19/89 09:33:10 ; goofy ; joelw_pc ; joelw ; ttyd3 ; SLIP;
```

Each field is separated by a semicolon (;). In order, the fields are:

- End time.
- Start time.
- Local hostname (or Internet address).
- Remote hostname (or Internet address).
- Login of user who invoked *ppl*.
- tty port used.
- Protocol used.

Note	The billing file is not pruned automatically. Be sure to check and/or prune the file at intervals appropriate to PPL usage.
-------------	-----------------------------------------------------------------------------------------------------------------------------

To disable this feature, simply remove the billing file. (If the file does not exist, *ppl* ignores this feature.)

Logging PPL Events

PPL events are recorded to an ASCII file named `/usr/spool/ppl/log`. Log messages are self-explanatory.

Using LAN/9000 Diagnostics, Logging and Tracing

LAN/9000 diagnostics *rlb*, *ping*, and *netstat* work over a PPL link the same as over the LAN. This is also true for network logging and tracing tools. No special accommodation must be made to use network diagnostics, logging and tracing over IP serial lines.

Reader Comment Sheet

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HP 9000 Series 300 and 800 Computers
Using Serial Line IP Protocols

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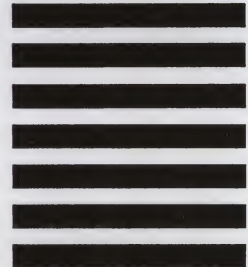
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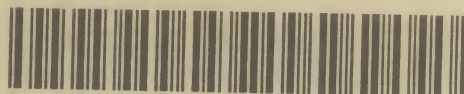


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